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COVID-19: Lessons for the climate change emergency

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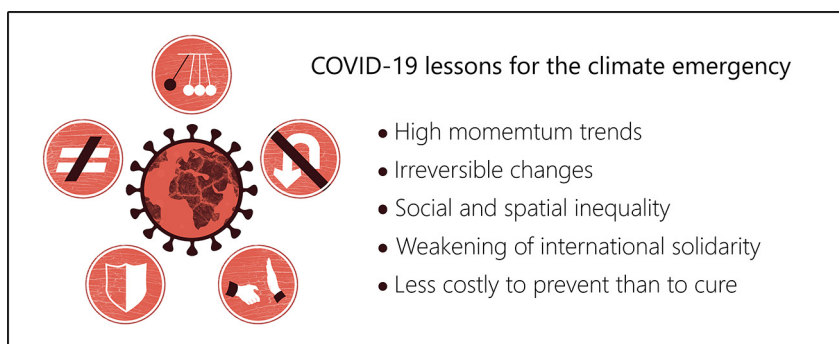
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HIGHLIGHTS

- There are important shared challenges between COVID-19 and climate change crises.
- Some are new for policymakers and public, difficult to manage, and counter-intuitive.
- We discuss main similarities and differences and highlight lessons for the future.
- Early action, forethought, and trust in science are key to face climate emergencies.

GRAPHICAL ABSTRACT



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ABSTRACT

The ongoing COVID-19 outbreak pandemic is now a global crisis. It has caused 9+ million confirmed cases and 400,000+ deaths at the time of writing and triggered unprecedented preventative measures that have confined a substantial portion of the global population and established 'social distancing' as a new global behavioral norm. The COVID-19 crisis has affected all aspects of everyday life and work, and heavily impacted the global economy. This crisis also offers unprecedented insights into how the global climate crisis may be managed, as there are many parallels between the COVID-19 crisis and what we expect from the imminent global climate emergency. Reflecting upon the challenges of today's crisis may help us better prepare for the future. Here we compile a list, by no means comprehensive, of the similarities and differences between the two crises, and the lessons we can learn from them: (i) High momentum trends, (ii) Irreversible changes, (iii) Social and spatial inequality, (iv) Weakening of international solidarity, and (v) Less costly to prevent than to cure.

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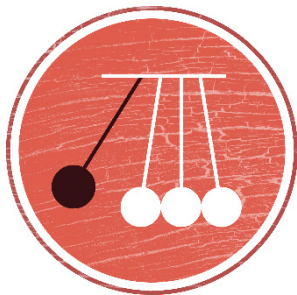
1. Introduction and lessons

The ongoing COVID-19 outbreak pandemic is now a global crisis. It has caused 9+ million confirmed cases and 400,000+ deaths at the time of writing and triggered unprecedented preventative measures

that have confined a substantial portion of the global population and established 'social distancing' as a new global behavioral norm. The COVID-19 crisis has affected all aspects of everyday life and work, and heavily impacted the global economy. This crisis also offers unprecedented insights into how the global climate crisis may be managed, as there are many parallels between the COVID-19 crisis and what we expect from the imminent global climate emergency. Reflecting upon the challenges of today's crisis may help us better prepare for the future. Here we compile a list, by no-means comprehensive, of the similarities and differences between the two crises, and the lessons we can learn from them:

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High momentum trends (also un-

derstood as time lags). The expansion dynamics of the SARS-CoV-2 virus are difficult for humans to grasp owing to its long incubation period (Linton et al., 2020), the prevalence of asymptomatic individuals (Nishiura et al., 2020), and its exponential growth (Levy and Tasoff, 2017), making pandemic crisis management extremely difficult. In a similar way, climate change also has a complex but even slower, temporal dimension. Climate change models and long-term forecasts are hard for the public and policy makers to grasp, as they challenge intuition and short-term thinking. In such cases, the crisis may only become obvious when it is too late to prevent it. Scientists have long cautioned about anthropogenic climate change and emphasized the need for strong and early action to prevent its worst consequences (Houghton, 1996; Oreskes, 2004; Ripple et al., 2019). But, as with the muted response to early warnings of the spread of SARS-CoV-2 in China, and even earlier warnings of the pandemic potential of SARS-CoV-like viruses (Cheng et al., 2007), much needed early action has not been taken. To date, only timid measures have been put in place to reduce the use of fossil fuels and CO₂ emissions. As a result, greenhouse gas concentrations have continued rising, even as both global and local temperatures repeatedly break records (IEA global Report on CO₂ emissions, 2019 (<https://www.iea.org/articles/global-co2-emissions-in-2019>, n.d.)), and extreme weather events become increasingly frequent (Fischer et al., 2013). The lesson to be learnt is clear- ignoring the early scientific calls for action ends up being costlier in the long-run, even if these measures appear initially punitive (Fig. 1).



Irreversible change. One of the most

challenging aspects of the COVID-19 crisis is the fact that once the virus has reached a certain abundance within a population its control becomes extremely difficult. Ongoing spread within the community lead to a chain reaction of exponential growth. It is very likely that changing climate operates in a similar fashion. Scientists increasingly agree that abrupt and irrevocable changes may ensue once temperatures have warmed beyond certain critical thresholds (Trisos et al., 2020). Also, changes in large-scale climate patterns may set new and irreversible processes into motion, with unforeseeable consequences. For example, changes in the polar jet stream (Meehl et al., n.d.), ocean salinity (Durack et al., 2016) and pH (Caldeira and Wickett, 2003), or the release of methane by melting permafrost (Whiteman et al., 2013), are likely to have large-scale and irreversible effects on global climate that reverberate for decades or centuries. As with taking early action in controlling COVID-19, identifying and preventing the crossing of climate change thresholds will help avert worst-case scenarios and reduce the economic and social costs of climate change (Jakob et al., 2012).



Social and spatial inequality. The

COVID-19 crisis, like the climate crisis, is having disparate impacts across nations and social groups. COVID-19 poses a much greater risk to elderly people and those with accompanying risks factors, e.g. existing respiratory illnesses (Yang et al., 2020a). Furthermore, the ability of a nation's healthcare system to control the virus, and to provide intensive care units, are crucial factors in determining spread and mortality. Recently, we have seen a clear drop in the number of new COVID-19 infections in many of the wealthiest nations, while those in economically depressed countries have increased rapidly. Fewer economic resources, social instability, and infrastructure have put these societies at a higher risk, not only in the short-term as they bear the brunt of the current health crisis, but also because the future impact on their economy is likely to be higher and their recovery slower, thus further increasing economic inequalities between nations. Climate change will operate similarly, as wealthier nations can invest in climate change prevention and reconstruction but, without a globally coordinated response to climate change, less developed nations will again suffer the worst climate change impacts (Althor et al., 2016), exacerbating even the inequalities caused by COVID-19.

Climate change and pandemic emergencies also do not equally affect social groups within nations. Low resource groups, such as those living paycheck-to-paycheck, and underrepresented groups will suffer the most from lockdowns, rising unemployment, and unexpected medical costs. While global temperatures may increase consistently across most of the world, changes in precipitation, extreme events, and sea level rise will vary from place to place and year to year, similarly creating local, regional, and societal emergencies that require forethought and social cooperation to manage them. Ensuring that the most vulnerable and unempowered are properly protected from the climate crisis consequences requires the early establishment of agreements, protections, and policies that will minimize social inequality when the crisis strikes.



Weakening of international soli-

arity. The current COVID-19 crisis may be one of the first faced by a highly globalized world where all nations directly compete for the same limited resources. Nations (or even states within a country) are tempted to protect their own citizens at whatever cost to others. Actions such as restricting the export of sanitary material (<https://www.theguardian.com/world/2020/mar/04/india-limits-medicine-exports-coronavirus-paracetamol-antibiotics>, n.d.), alleged attempts to guarantee exclusive access to a vaccine in development (<https://www.politico.eu/article/germany-confirms-that-donald-trump-tried-to-buy-firm-working-on-coronavirus-vaccine/>, n.d.), or disagreements within the European Union about the scale of economic solidarity needed to deal with the current crisis (<https://www.bbc.com/news/world-europe-52200719>, n.d.), are all clear examples of this behavior. Even when a

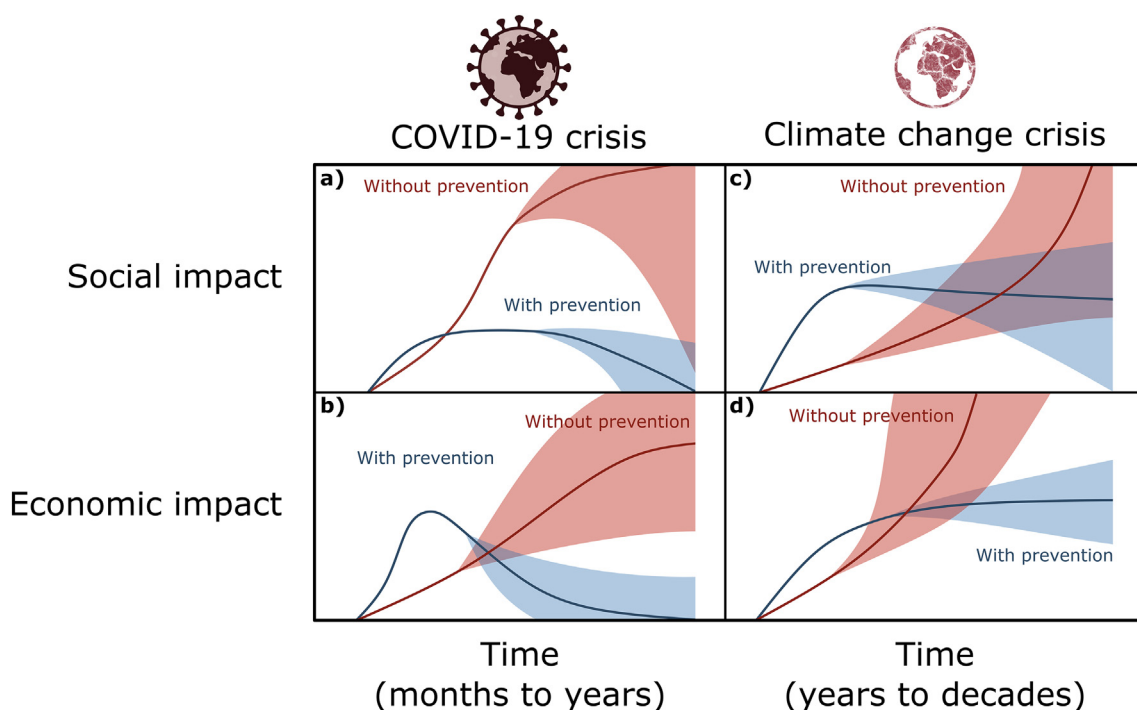


Fig. 1. Hypothetical social and economic impacts of the COVID-19 and climate crises in the presence and absence of preventative measures. Note the different timescales. **a)** Reduction of the social impact (as burden on the healthcare system) associated with 'flatten the curve' strategies. Early preventative measures, such as lockdowns or quarantine, can have a high initial social cost. **b)** Early action can also have a high initial impact but reduce the long-term economic impact, while inaction may cost less in the short-term but have greater long-term impact. **c)** Early action may entail higher social costs due to lifestyle and employment change and economic transition (e.g. to new energies, re-building infrastructure) but will prevent the large social costs of extreme events, water shortages, conflicts, etc. **d)** Economic investment in climate change prevention has a high initial impact but helps to avoid the worst long-term economic damage. In contrast, climate change inaction can have unimaginably high economic costs in the long term. Uncertainties are highlighted as shaded areas around the curves.

vaccine for SARS-CoV-2 is finally developed, it is unclear which protocols will be followed to distribute it in a fair and effective way. International disputes and unequal access seem likely. Climate change will likely bring a repeat of this scenario, but at a potentially greater scale. Increasingly frequent extreme events (Fischer et al., 2013; Fischer and Schär, 2010) and food or water shortages (Schmidhuber and Tubiello, 2007) across the globe would cause competition for resources and mass migration that will test the limits of solidarity within and between nations. Although there have been calls for a coordinated global action and protocol to help to manage and reduce the dramatic effects of the COVID-19 crisis, discussions, agreements, and national concessions have been extremely limited so far. We must learn from this. Again, acting now to establish international agreements and road maps to deal with the future global crises will decrease the chances of nationalistic policy responses, egotistic behaviors or political leaders prioritizing powerful or wealthy individuals over the World's general population.



Less costly to prevent than to cure.

Early action is essential to avoid worst-case scenarios for both the climate crisis (Chakra et al., 2018) and pandemics (Horby, 2018). However, by their very nature, successful preventative actions are likely to be considered wasteful once the risk is averted, and successfully prevented risks will tend to be perceived as unimportant in retrospect. The response to previous pandemic alerts, such as that created by the SARS outbreak in 2003, show us that preventative measures may be

perceived by some members of the general public as of superfluous expenditure a posteriori (once the worst scenarios are averted). However, the lessons learned in 2003 facilitated faster DNA sequencing and the development of rapid response strategies that have helped some nations in the current crisis (Yang et al., 2020b). Similarly, during the current crisis, certain countries that imposed early and effective preventative measures, such as Germany, have seen strong anti-lockdown movements, likely bolstered by public failure to perceive the averted risk (e.g. (Burke et al., 2015)), thus highlighting the importance of risk communication and public engagement.

Multiple studies have shown that climate-change prevention (mitigation) is also far more economically efficient solution than adaptation, with alarming figures of the economic consequences of not implementing mitigation actions globally (Burke et al., 2015; Glanemann et al., 2020; Wei et al., 2020). Two changes in policy may be useful for the future:

- (i) Climate change prevention can be communicated as an investment without necessary return, in a similar way that most of us frame personal health insurance, where we accept expenditure to protect from potentially negative outcomes that may never come to pass. In a manner similar to investment in pandemic prevention, it is imperative to forest public understanding that the cost of these investments is necessary to avoid later, far greater costs (Fig. 1). Such actions should avert public resistance to expensive climate change action, and the risk of inaction.
- (ii) Evidence from the COVID-19 pandemic to date suggests that countries which sent clear, consistent and serious messages to the public regarding the consequences and risks of the pandemic (e.g. Germany, New Zealand, South Korea) have more effectively contained the disease than those which denied or played down risks and sent inconsistent messages to the public (e.g. United Kingdom, USA). Although it is too early to reach definitive conclusions, it is likely that this effective handling has also minimized health, social, economic and reputational damage in the

long run (<https://www.theguardian.com/business/2020/jun/10/uk-economy-likely-to-suffer-worst-covid-19-damage-says-oecd>, n.d.). The management of climate change faces a similar challenge of communicating the need for early and strong action in the face of a distant threat, enhanced by the global nature of the challenge and the lack of counterexamples between countries to demonstrate success. Nevertheless, lessons from the COVID-19 crisis may be learnt that may help in formulating successful communication strategies. Furthermore, working to maintain the public trust in scientists that has been gained during the COVID-19 crisis and build on the increased public understanding of risk aversion may help provide a foundation for efforts aiming to create a social push for preventative action to protect from climate change. Such initiatives are needed, if we are to motivate policymakers to prioritize long-term safety over short-term costs and economic gain.

2. Some notable differences

While there are striking similarities between the climate and COVID-19 crises, they also differ in many fundamental ways, including the speed at which they develop. As mentioned above, the COVID-19 crisis can both occur and be controlled rapidly, in comparison to the more slowly looming climate crisis, whose impacts may be even greater (Fig. 1). The current crisis, while heterogeneous, is also likely to be more synchronous across large areas and nations than climate change, which will vary massively in frequency, intensity, and timing across the world (Pachauri et al., 2014). It is also interesting to think about the link between an individual person's actions and their consequences in both crises. While individual actions, such as personal travelling and dietary decisions, have consequences for climate change, the cause-effect relationship is more indirect and diffuse than in the case of a viral crisis, where the link between personal actions (such as social distancing) and prevention of the spread of the virus is clear and compelling. This, along with the deep time-lags of climate dynamics we already mentioned, makes the challenge of altering behavior, far greater for climate change. Finally, there are no safe climate change vaccines or potential treatments to be developed that could 'solve' the climate crisis, and any activities aiming for the reversal of climate change would likely take decades or more before coming to fruition. The COVID-19 crisis shows us the importance of prevention and early action, and this may be even more important in averting the worst outcomes of climate crisis.

3. Conclusions

As we now struggle to cope with a global crisis, it is tempting to argue that the looming climate crisis is not our most pressing concern, and that its mitigation should be postponed for happier and more prosperous times. However, it is clear that the COVID-19 crisis offers important lessons for the upcoming global climate crisis. Global emergencies are not new, but our ability to understand, prevent, and manage them is now greater than ever before. Let us learn from the current situation and act now to prevent the worst potential consequences of a crisis that we and future generations will almost certainly have to bear.

CRedit authorship contribution statement

Rubén D. Manzanedo: Writing - original draft, Methodology, Writing - review & editing, Visualization. **Peter Manning:** Writing - review & editing, Methodology, Visualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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